DOCUMENT RESUME

ED 066 782 EA 004 357

AUTHOR Pinto, Patrick R.; Pinder, Craig C.
TITLE A Cluster Analytic Approach to the Study of Organizations.
INSTITUTION Minnesota Univ., Minneapolis. Industrial Relations Center.
REPORT NO WP-71-11
PUB DATE Apr 72
NOTE 24p.; Paper presented at International Meeting of the Institute of Management Sciences (19th, Houston, Texas, April 4-8, 1972)

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Behavioral Science Research; Behavior Rating Scales; Classification; *Cluster Analysis; Cluster Grouping; Data Analysis; Demography; Group Behavior; Grouping Procedures; Group Structure; Industrial Structure; Institutional Research; Occupational Clusters; Organization; *Organizations (Groups); Structural Analysis; Work Environment; Work Experience

ABSTRACT

Two hundred twenty-seven organizational units drawn from a variety of industries were cluster-analyzed on the basis of their similarities across 18 behavioral and structural dimensions of effectiveness. Using a multivariate subgrouping procedure, eight homogeneous clusters of units were found, varying in size from 8-65 units, and each characterized by a distinct behavioral profile. Within-cluster differences were described in terms of the 18 dimensions, overall unit effectiveness, and in terms of other "demographic" variables that were external to the clustering process. These variables included unit function, work setting dispersion, growth, technology employed, and skill level of the unit members. Significant relationships were found between the behavioral styles of the clusters on the one hand and each of the demographic variables and the overall criterion of effectiveness on the other. The rationale and benefits of clustering organizational units into groups were discussed, and further research ideas were proposed. (Author)

ED 066782

PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL HAS BEEN GRANTED BY
Patrick R. Pinto

TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE U.S. OFFICE OF EDUCATION. FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER.

Not for publication or quotation without permission of the authors

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY

Working Paper
71-11

A CLUSTER ANALYTIC APPROACH TO THE STUDY OF ORGANIZATIONS

Patrick R. Pinto
Craig C. Pinder

Industrial Relations Center
University of Minnesota
April 1973

EA 004 357

FILMED FROM BEST AVAILABLE COPY

A Cluster Analytic Approach to the Study of Organizations[1]

Patrick R. Pinto and Craig C. Pinder

Organizational effectiveness has been studied from many viewpoints in an attempt to determine its components or correlates (see Bowers & Seashore, 1966; Cyert & March, 1959; Lawrence & Lorsch, 1967; Likert, 1958; Mahoney, 1967; March & Simon, 1959). Among the variables most often presumed to be related to effectiveness are goal emphasis, delegation, turnover, growth and expansion, mutual confidence and trust, profitability, satisfaction, and flexibility, to mention a few. The variety of these components suggests that overall organizational effectiveness is certainly not a unitary concept, and should perhaps be operationally based on the judgements of managers who must regularly assess the effectiveness of their subordinate groups.

In a continuing series of studies conducted at the Industrial Relations Center (see Frost, Crandall, Mahoney & Weitzel, 1971; Mahoney, 1967; Mahoney & Weitzel, 1969; Weitzel, Mahoney & Crandall, 1971) various criteria of effectiveness have been investigated. Managers in participating organizations completed questionnaires dealing with the performance of their subordinate units along a number of empirically-derived dimensions of effectiveness. Managerial judgements regarding the overall effectiveness of each unit were also collected in order to provide some "yardstick" for measuring the relative importance and the interrelationships among the various components. From the above data, a number of studies have been completed. The typical procedure in these studies has been to analyze the relationships between these descriptive variables, rather than considering the relationships among the complete organizational units themselves.

---

[1]The work reported here has received support from the University of Minnesota's Industrial Relations Center and was aided in part by ONR Contract No. N00014-68-A-0141-0003. The authors wish to thank T.A. Mahoney and W. Weitzel for their valuable criticisms of an earlier draft, and H.E.A. Tinsley for programing assistance.

A New Approach

An alternative approach which recognizes the multivariate nature of organizational relationships is suggested by certain behavioral science techniques that deal with individual test data. These procedures can cluster subjects into homogeneous subgroups on the basis of their similar test profiles. If one considers each organizational unit to be a distinct "subject" with a "profile" based on a number of dimensions, the situation is quite amenable to the use of any of the standard multivariate clustering techniques that have been developed for subgrouping large samples (see Ball, 1965; Jones, 1968).

Cluster analytic procedures, when applied to samples of organizations, should help us to conceptually reduce their diversity and complexity, and allow us to speak in more general terms of groups or "types" of organizations, rather than speak of individual companies or units. Since it has been shown that organizations share many common and measurable characteristics, it follows that some organizations will be similar to others in some of these characteristics. In the same way as biological and physical scientists have developed taxonomies to help understand the similarities and differences between animals and the elements, so also behavioral scientists can develop taxonomies for the understanding of organizational complexities.

If we can group organizational units, and study the demographic and structural similarities between organizations with similar behavioral characteristics, we will be better able to understand the underlying nature and causes of these behaviors as well as to predict future behavior and performance. The present study demonstrates such an approach.

Method and Results

In the study reported here, ratings on 13 dimensions of organizational behavior (see Table 1), which have been found to be related to effectiveness (Mahoney, 1967; Mahoney & Weitzel, 1969), were used as the basis for subgrouping 227 organizational units. The units were sampled from a variety of industries ranging from finance and insurance to the manufacturing of electronic computers. They ranged in size from less than ten employees to more than one hundred employees.

Insert Table 1 about here

The sample was cluster analyzed according to the hierarchical grouping procedure described by Ward and Hook (1963). This technique iteratively groups individuals (or organizational units) on the basis of their profile similarities, such that the clusters formed are homogeneous and mutually distinct. It accomplishes this by maximizing an objective function analogous to the ratio of between to within group variance.

In this case, the Cronbach and Gleser (1953) D^2 statistic was the metric used to determine similarity between organizational units across the behavior dimensions. Inspection of the plot of error terms (Ward & Hook, 1963) indicated that the optimal solution was eight clusters, varying in size from eight to 65 organizational units. Since the order of group formation is of no consequence, these will be referred to here as clusters 1 through 8.

Cluster Descriptions

In cluster analytic work, it is desirable to describe the subgroups derived in terms of the variables on which the grouping was based. This

Table 1

Dimensions of Organizational Effectiveness[a]

Dimension	Definition
Flexibility	Willingness to try out new ideas and suggestions, ready to tackle unusual problems.
Development	Personnel participate in training and development activities.
Cohesion	Lack of complaints, grievances, and conflicts.
Democratic supervision	Subordinate participation in work decisions.
Reliability	Meets objectives without necessity of follow-up and checking.
Delegation	High degree of delegation by supervisors.
Bargaining	Rarely bargains with other organizations for favors and cooperation.
Results Emphasis	Results, output, and performance emphasized, not procedures.
Staffing	Personnel flexibility among assignments; backups available.
Decentralization	Work and procedural decisions delegated to lowest levels.
Planning	Operations planned and scheduled to avoid lost time; little time spent on minor crises.
Cooperation	Operations scheduled and coordinated with other organizations; rarely fail to meet responsibilities.
Productivity-support-utilization	Efficient performance; mutual support and respect for supervisors and subordinates; utilization of personnel skills and abilities.
Communication	Free flow of work information and communications within the organization.
Initiation	Initiates improvements in work methods and operations.
Supervisory control	Supervisors in control of progress of work.
Conflict	Little conflict with other organization units about authority or failure to meet responsibilities.
Supervisory backing	Supervisors support their subordinates.

[a]Adapted from Mahoney & Weitzel, 1969, p. 358.

procedure serves the following purposes:

(1) first, it allows us to discover what, in fact, the individuals in each cluster actually do have in common;

(2) it serves as a check on the accuracy of the grouping, since within-group variances on most of the grouping variables should be relatively small;

(3) finally, it provides us with a basis for postulating relationships between the clusters and other external, or "demographic", variables which characterize the unit.

Included in the descriptive analysis of our eight organizational unit clusters were:

(1) the 18 behavioral dimensions which had served as the basis for the formation of the clusters;

(2) five "demographic" characteristics which were obtained from the managers' responses; and,

(3) the overall effectiveness ratings of the units, as evaluated by the supervisors.

Between-Cluster Differences in Behavioral Patterns

The mean scores and standard deviations for the eight clusters on each of the 18 clustering dimensions, are presented in Table 2.

Insert Table 2 about here

It can be seen that the patterns of mean dimension scores differ from cluster to cluster. Further, the variances on the dimensions for each cluster are relatively small, indicating the homogeneity of the clusters.

Table 2

Means and Standard Deviations for Eight Clusters on 18 Dimensions of Effectiveness

		1 Flx.	2 Dev.	3 Coh.	4 D.S.	5 Rel.	6 Del.	7 Barg.	8 R.E.	9 Stf.	10 Dec.	11 Plng.	12 Coop.	13 P.S.U.	14 Comm.	15 Init.	16 S.C.	17 Con.	18 S.B.
Cluster																			
1	$\bar{X}$	99.11	36.58	23.17	5.84	13.28	27.66	7.58	27.42	39.23	12.91	90.00	62.00	75.78	37.52	6.41	22.36	39.41	7.67
	SD	10.23	6.13	2.85	1.43	2.46	3.71	1.42	3.67	5.79	3.99	6.96	4.43	5.26	3.29	1.50	2.03	3.56	.93
2	$\bar{X}$	70.48	25.52	17.29	5.00	9.10	21.71	5.57	24.38	33.86	13.43	59.52	42.48	51.71	25.90	4.05	16.67	28.38	5.90
	SD	9.54	5.60	3.65	1.58	2.41	3.68	1.53	3.94	4.98	3.65	9.83	6.04	8.25	4.79	1.16	2.89	5.71	1.37
3	$\bar{X}$	92.04	33.00	19.72	4.28	8.36	27.44	6.20	27.32	39.00	10.04	83.48	57.52	72.84	36.96	6.64	22.72	36.84	7.80
	SD	10.90	4.86	3.58	1.54	3.09	4.49	2.14	3.09	8.53	3.23	10.00	5.39	4.50	3.02	1.60	3.01	4.12	.82
4	$\bar{X}$	86.16	26.79	18.84	4.21	9.37	26.63	7.53	24.11	41.84	13.37	80.26	58.32	63.42	33.21	6.16	21.11	36.63	6.63
	SD	8.36	5.55	4.66	1.27	2.71	3.34	1.39	3.46	4.40	2.83	9.06	7.02	5.97	3.15	.96	2.71	4.27	.83
5	$\bar{X}$	108.20	31.33	24.87	7.20	15.47	28.13	8.60	22.00	42.53	10.00	95.13	66.80	79.27	40.20	7.80	23.80	42.27	8.47
	SD	6.94	8.76	2.07	1.42	2.45	4.41	.63	6.64	3.98	2.33	8.17	3.28	5.01	3.26	1.21	2.42	2.49	.64
6	$\bar{X}$	100.50	38.50	23.25	3.38	15.75	25.13	8.25	28.25	30.63	8.38	87.38	60.00	80.88	34.75	7.88	22.38	35.75	8.25
	SD	12.08	5.32	2.87	1.19	1.91	4.05	.89	2.82	9.75	3.07	7.39	5.73	4.16	5.28	.83	2.77	4.62	1.16
7	$\bar{X}$	83.98	33.38	19.88	6.12	10.12	23.32	6.38	23.71	32.35	14.46	69.97	50.14	64.62	32.91	5.28	17.46	33.86	6.89
	SD	10.01	4.64	3.25	1.65	2.45	3.67	1.78	3.84	6.87	3.54	9.53	5.78	6.55	3.80	1.85	2.98	4.28	1.00
8	$\bar{X}$	100.00	27.80	23.80	7.00	10.50	29.80	8.40	22.60	27.20	7.60	91.40	58.60	78.00	39.20	6.30	24.40	40.30	5.70
	SD	7.41	8.00	3.88	1.89	2.07	1.48	.84	6.77	9.68	4.81	6.36	4.12	4.67	4.61	1.25	2.46	3.40	1.25
GM[a]		90.96	32.76	21.08	5.59	11.23	25.79	7.02	25.25	36.34	12.54	80.22	56.09	69.51	34.85	6.01	20.55	36.38	7.20
SD		13.93	6.85	3.96	1.78	3.36	4.41	1.79	4.48	7.75	4.06	13.88	8.60	10.00	5.22	1.78	3.72	5.45	1.23

[a]Grand mean and standard deviation are based on entire sample (N = 227).

Table 3 presents cluster profiles in terms of mean dimensions scores standardized on the total 227 units. Consideration of these standard score profiles enables us to further characterize the behavioral differences among the clusters. For example:

Insert Table 3 about here

Cluster 1. (No. Units = 64; Mean Overall Effectiveness Score = 8.00)

This cluster was composed of units which were neither exceptionally high nor exceptionally low in any of their component dimension scores. Their salient behavioral characteristics were planning, cooperation, productivity-support-utilization and reliability. Their lowest standard scores were on the decentralization and democratic supervision dimensions.

Cluster 2. (N = 21; M.E.S. = 7.67)

Cluster 2 was composed of units scoring very low on all of the behavioral dimensions. In fact, their standard score on decentralization was the only one of the eighteen which was positive. Units in this subgroup scored very low on the following dimensions: flexibility, development, cohesion, planning, cooperation, productivity-support-utilization, communication, and conflict.

Cluster 3. (N = 25; M.E.S. = 7.52)

The units in this cluster, similar to those in cluster 1, scored neither very high nor very low on any of the eighteen clusters. Their highest standard scores came on the supervisory control and the supervisory backing dimensions. Their lowest behavioral dimensions were reliability and democratic supervision.

Table 3

Mean Standard Scores on 18 Components of Effectiveness plus Overall Effectiveness for Eight Organizational Clusters

Dimension	Cluster 1 (N=64)	2 (N=21)	3 (N=25)	4 (N=19)	5 (N=15)	6 (N=8)	7 (N=65)	8 (N=10)
Flexibility	+.58	-1.47	-.08	-.34	+1.24	+.69	-.50	+.65
Development	+.55	-1.05	+.04	-.87	- .21	+.84	+.10	-.72
Cohesion	+.53	- .96	-.34	-.57	+ .96	+.55	-.30	+.69
Democratic supervision	+.14	- .33	-.74	-.78	+ .90	-.56	+.30	+.79
Reliability	+.61	- .63	-.85	-.55	+1.26	+1.29	-.33	-.22
Delegation	+.42	-.93	+.37	+.19	+ .53	-.15	-.56	+.91
Bargaining	+.31	-.81	-.46	+.28	+ .88	+.69	-.38	+.77
Results Emphasis	+.49	-.19	+.46	-.25	- .72	+.67	-.34	-.59
Staffing	+.37	-.32	+.34	+.71	+ .80	-.74	-.51	-1.18
Decentralization	+.09	+.22	-.49	+.20	- .63	-1.02	+.47	-1.21
Planning	+.70	-1.49	+.23	+.00	+1.07	+.52	-.74	+.81
Cooperation	+.69	-1.58	+.17	+.26	+1.25	+.46	-.70	+.29
Productivity-support-utilization	+.63	-1.78	+.33	-.61	+ .98	+1.14	-.49	+.85
Communication	+.51	-1.71	+.40	-.31	+1.02	-.02	-.37	+.83
Initiation	+.23	-1.10	+.36	+.09	+1.01	+1.05	-.40	+.17
Supervisory Control	+.49	-1.04	+.58	+.15	+ .87	+.49	-.83	+1.03
Conflict	+.56	-1.47	+.08	+.05	+1.08	-.12	-.46	+.72
Supervisory Backing	+.39	-1.04	+.50	-.46	+1.04	+.86	-.24	-1.21
Effectiveness	+.65	- .87	-.09	-.28	+ .75	+.99	-.59	+.42

Cluster 4. (N = 19, M.E.S. = 7.20)

This group was composed of units who scored relatively high on the staffing dimension, and relatively low on the development, cohesion, democratic supervision, reliability, and productivity-support-utilization dimensions.

Cluster 5. (N = 15, M.E.S. = 6.48)

Cluster 5 was composed of units which scored relatively high on most of the component dimensions, and on the overall effectiveness rating. Their "strongest" points were on the flexibility, reliability, planning, cooperation and conflict dimensions. They were relatively low on results emphasis and decentralization.

Cluster 6. (N = 8, M.E.S. = 6.21)

This cluster was the smallest in terms of the number of similar units. The profiles of these units generally were more jagged, or showed more "relief" than those of other clusters. That is, they scored very high on the reliability, productivity-support-utilization, and initiation dimensions, but were also very low in the democratic supervision and staffing dimensions.

Cluster 7. (N = 65, M.E.S. = 5.77)

The largest of the eight clusters, this group of units was generally characterized by low dimension scores and relatively low ratings on overall effectiveness. They had positive standard scores on only three of the factors, the highest of which was on decentralization. They scored very low on the flexibility, delegation, staffing, planning, cooperation, and supervisory control variables.

Cluster 8. (N = 10, M.E.S. = 5.38)

This cluster was composed of units scoring high on the following dimensions: flexibility, cohesion, democratic supervision, delegation, bargaining, planning, productivity-support-utilization, communication, supervisory control, and conflict. However, units in cluster 8 also scored very low on development, results emphasis, staffing, decentralization, and supervisory backing. It is noted that this cluster was relatively small, being composed of only 10 units.

Between-Cluster Differences in Demographic Characteristics

These results indicate that the eight clusters differed greatly in terms of the behavioral patterns with which they achieved overall effectiveness. However, there were also noticeable differences among the clusters in terms of various demographic variables.

Chi-square tests revealed between-cluster differences in the following variables:

a) the primary function that the units in each of the eight clusters served within their respective organizations;

b) the degree to which the clusters were composed of units whose members worked in the same room or area;

c) the skill level of the units;

d) the predominant technology employed;

e) whether the units within the various clusters had expanded in number of employees, reduced, or had shown no growth or shrinkage in size over the past five years.

These cluster differences in demographic variables are reported below, and are summarized in Table 4.

Insert Table 4 about here

Unit Function.

A five-way classification of the primary function of the individual units as they related to their respective companies was determined from the unit managers' responses. Since only one unit was classified as "Research", and two were classified as "Purchasing", the five classifications were collapsed to include only "Production" (N = 63); "Sales" (N = 122); and "Other" (N = 49). Three responses to this item were unusable, so only 224 units were included in the analysis of the relationship between cluster membership and unit function. A chi-square test indicated that a significant association existed ($x^2 = 38.15$, $p < .001$). The units in clusters 3 and 4 were predominantly production units, while clusters 5 and 6 tended to include more sales units than would be expected, given the marginal distribution.

Unit Dispersion.

Units were characterized as to whether employees worked in the same room or area, or were dispersed into various locations. A chi-square test showed that some of the clusters were composed of units which were highly consistent in their responses to this item. Although the overall chi square between the cluster membership and this proximity variable failed to reach conventional significance ($x^2 = 13.71$, $.05 < p < .10$), two clusters appeared to account for most of the differences in the relative frequencies of the replies to this item. A very high proportion of the supervisors in cluster 4 indicated that their units did not work in the same room or area, whereas a high proportion of the supervisors in cluster 5 replied positively to this question.

Table 4

Relationships Between Cluster Memberships and Demographic Variables

Demographic Variable	Cluster 1	2	3	4	5	6	7	8	Total
Unit Function[a]									224
Production	12	6	11	10	2	1	6	5	53
Sales	37	8	9	6	12	7	40	3	122
Other	12	7	5	3	1	0	19	2	49
Unit Dispersion[b]									227
Not Dispersed	36	12	13	3	11	4	33	5	117
Dispersed	28	9	12	16	4	4	32	5	110
Skill Level[c]									227
High	20	2	7	3	3	4	27	1	67
Medium	12	5	8	3	1	2	19	2	52
Low	32	14	10	13	11	2	19	7	108
Technology[d]									227
Long-Linked	31	14	13	15	9	1	22	6	111
Non-Long	33	7	12	4	6	7	43	4	116
Change in Size[e]									
Growing	35	9	14	3	6	3	40	2	112
No Change	13	6	7	6	2	1	13	4	52
Shrinking	16	6	4	10	7	4	12	4	63
N =	64	21	25	19	15	8	65	10	

[a] $\chi^2 = 38.15$, $p < .001$

[b] $\chi^2 = 13.17$

[c] $\chi^2 = 30.43$, $p < .01$

[d] $\chi^2 = 18.48$, $p < .01$

[e] $\chi^2 = 26.82$; $p < .05$

Skill Level.

Units were also described in terms of the skill level of their employees, i.e., the percentage of the jobs which require specialized training or education. Skill level was categorized as low (0% - 25%), medium (26% - 75%) and high (76% - 100%). Inter-cluster differences in skill level were estimated, using a chi square test of the frequency of each of the three skill levels within the groups. Clusters 2, 4, 5 and 8 seemed to contain more low skill units than would occur by chance, while clusters 6 and 7 contained a significantly high proportion of high skill level units ($x^2 = 30.43$, $p < .01$).

Technology.

Between-cluster differences in terms of unit technology were investigated. The 227 units were classified into the three major types of technology discussed by Thompson (1967), viz., long-linked, mediating, and intensive.

Thompson defined long-linked technologies as those in which production follows a prescribed and invariant sequence, such as in the case of a mass-production assembly line. Work at any stage of production is dependent upon the successful completion of work at earlier stages. A mediating technology is defined as one in which the primary function of the unit concerned is ". . . the linking of clients or customers who are or wish to be interdependent (Thompson, 1967, p. 16)." Such a technology involves the execution of any of a number of prescribed methods, in the service of multiple and diverse clients and customers, such as in the case of a bank. An intensive technology is one in which ". . . a variety of techniques is drawn upon in order to achieve a change in some specific object; but the selection, combination, and order of application are determined by feedback from the object

itself (p. 17)." Research and development units generally employ an intensive technology.

Since two of the clusters were small (containing eight and ten units, respectively), the expected frequencies of each of the technologies in these clusters were below the minimum requirement suggested by Siegel (1956) to allow a X^2 test of independence. Therefore, two classifications were combined and all units were classified as either long-linked or non-long-linked. This dichotomy resulted in two meaningful groups, containing 111 and 116 units respectively. A X^2 test showed that there were significantly more long-linked units in clusters 2 and 4 than would occur by chance, and that the frequency of non-long-link units in clusters 6 and 7 was also greater than could be expected on a chance basis ($X^2 = 20.91$, $p < .01$).

Growth and Reduction.

A X^2 test showed that there were significant differences between the clusters in the proportion of units within them which had grown, contracted, or remained constant in size. Cluster 7 was composed of a larger proportion of growing units than would occur by chance, while clusters 4 and 8 were composed of units which were shrinking in size ($X^2 = 26.82$; $p < .05$).

An analysis of the variance in the size change variable supported the results of the chi-square test. The mean change in size over the past five-year period (as a percentage growth or shrinkage) was calculated for each cluster. The one-way analysis of variance revealed that the overall differences among the eight means were significant ($F = 3.22$; $p < .003$).

Between-Cluster Differences in Overall Effectiveness.

As mentioned previously, all 227 units were judged in terms of their "overall effectiveness" by the raters. The mean cluster scores on this overall criterion dimension were computed and compared using a one-way analysis of variance, and a subsequent Newman-Keuls analysis of the ordered differences among the cluster means.

The analysis of variance indicated that there were great differences between the clusters in terms of their mean ratings on this dimension ($F = 19.2$, $p < .001$).

In order to test the significance of specific inter-cluster differences in overall effectiveness, the Newman Keuls procedure for unequal sample sizes described by Winer (1963) was employed. The results of these comparisons are summarized in Table 5.

Insert Table 5 about here

Discussion

Between-cluster differences in the predominant functions of the units showed that clusters 3 and 4 contained a significant proportion of production units, whereas clusters 5 and 6 were primarily sales units. Note that the production-oriented clusters scored lower on the cohesion, reliability, and initiation dimensions.

The reliability dimension involves the ability of the unit to function without requiring follow-up and checking by supervisors. We have found that sales units are considered more "reliable" than production units. It is suggested that sales units, by the very nature of their function, have fewer

Table 5

Matrix of Ordered Differences and Newman-Keuls Analysis of

Cluster Means for Overall Effectiveness

Cluster		6	5	1	8	3	4	7	2
Number of Units		8	15	64	10	25	19	65	21
Mean Effectiveness		8.00	7.67	7.52	7.20	6.48	6.21	5.77	5.38
Cluster	6	----	.33	.48	.80	1.52**	1.79**	2.33**	2.62**
	5		----	.15	.40	1.19**	1.46**	1.90**	2.29**
	1			----	.32	1.04*	1.31**	1.75**	2.14**
	8				----	.72	.99*	1.43**	1.82**
	3					----	.27	.71	1.10*
	4						----	.44	.83
	7							----	.39
	2								----

** = $p < .01$
* = $p < .05$

supervisory checks and follow-ups than production units to meet their objectives.

We can readily accept the suggestion that sales units must display more initiative than production units, since success in sales demands innovative and dynamic tactics. Clusters 5 and 6, the "sales" clusters, both displayed more initiation than did the predominantly production-oriented clusters.

Since we defined cohesion as lack of expressed conflict, these results suggest that more conflict is found in production than in sales units. If we can assume that sales personnel are more often non-unionized, exempt employees than are production workers, we can understand this difference, since sales people would have fewer formal channels in which to express their grievances.

Although the overall differences between clusters in the dispersion of the employees in their units was not statistically significant, it was found that cluster 4 was composed largely of units with dispersed personnel, whereas the units in cluster 5 were predominantly compact. We note that cluster 4 units were on the average, much less effective than those in cluster 5. We also found cluster 5 to be much higher than cluster 4 in flexibility, cohesion, democratic supervision, reliability, planning, cooperation, productivity-support-utilization, supervisory control, and supervisory backing. Of course, the communication dimension was higher in cluster 5, than in cluster 4, and their relative degrees of dispersion are verified by the differences in their respective scores on the decentralization dimension.

We cannot conclude on the basis of this comparison alone, that high unit compactness necessarily leads to effectiveness, but we can infer that dispersed units may have unique problems in achieving effectiveness.

Long-linked technologies, featuring sequential production and repetition of tasks by the same individuals, have been the subject of much of the research and theory in the human relations literature. Investigators and reviewers such as Hulin and Blood (1969) have shown interest in the effects of job design and complexity, task diversity, and job enlargement upon dependent measures such as productivity and satisfaction. Although the nature of these relationships is not clearly understood, it is agreed that technological variables play a large role in the nature of organizational behavior.

This study found relatively high frequencies of units with long-linked technologies in clusters 2 and 4. Reference to Table 3 suggests that these clusters, although they differ on most of their behavioral dimensions, both featured relatively low development activities and low cohesion scores, as well as a relatively high degree of decentralization, compared to the other clusters. Low development scores indicate that units in these clusters generally do not train and promote their employees to fill higher positions, but rather recruit for higher positions from external labor markets. If this is the case, such units may feature jobs wherein turnover is high (suggested by their low cohesion scores), and where the degree of training necessary to do the jobs in minimal. In fact, it <u>was</u> found that clusters 2 and 4 were composed largely of low skill units, relative to most other clusters. Can we conclude that low skill, assembly line jobs are often dead-end positions? If that is the case, what sorts of individual satisfaction, group morale, and unit turnover can we expect to find in these positions? We found, in fact, that cohesion was perceived to be low in these units.

These results, however, should not lead us to conclude that long-linked technology and low skill level in a unit, by themselves, will be related to poor morale and cohesion. It was found that clusters 5 and 8, which are also

predominantly long-linked, low in skill level and development, were both relatively high on the cohesion dimension.

Table 3 shows us that the major differences between clusters 2 and 4 on the one hand, and clusters 5 and 8 on the other, are the higher communication and democratic supervision found in units of the latter pair of clusters. We note also that clusters 5 and 8 scored higher mean overall effectiveness scores than the former pair.

Reference to Table 3 suggests that clusters 1, 3 and 7, composed of rapidly expanding units, seemed to have little in common in terms of their behavioral profiles. Moreover, their standardized mean ratings on overall effectiveness were +.65, -.09, and -.59, respectively. All three units scored positively on development activities, but the trend was not striking. On the basis of this analysis, it was difficult to characterize "growing" units behaviorally. It is noted, however, that clusters 1, 3, and 7 were among the largest of the 8 sub-groups.

Conversely, it was found that those clusters which contained units whose size had decreased (numbers 4, 6 and 8) were similar in their positive standard scores on the bargaining, cooperation, initiation, and supervisory control dimensions. Again these similarities were not striking and seem to provide few clues regarding the behavioral style which may be characteristic of shrinking organizational units. It is noted that clusters 6 and 8 scored very low on the decentralization dimension. There appears to be no single reason, however, that the units in clusters 6 and 8 should suffer shrinkage in size, as a result of their low ratings in decentralization. The three "shrinking" clusters were among the smallest of the eight, in terms of number of component units, but there appears to be no necessary reason for this

relationship, nor for the trend mentioned above; i.e., that the "growing" clusters were the largest clusters in the sample.

The highly significant F ratio suggests a strong relationship between cluster membership and overall effectiveness. Actually, examination of the post hoc comparisons suggests that, even where mean levels of effectiveness are nearly the same, different behavior patterns could be responsible. In other words, the same organizational consequences may be caused by different antecedent conditions. For example, clusters 5 and 6 have nearly the same mean effectiveness scores, yet their patterns are distinct, and can be highlighted by differences in supervision and results emphasis. Cluster 5 reaches its high organizational effectiveness through democratic supervision and lessened emphasis on results. Cluster 6 may attain its high overall effectiveness through strong results emphasis combined with more authoritarian supervision. The staffing and development dimensions provide further differentiation of these two clusters. The units in cluster 5 have less participation in training and development activities than those in cluster 6, yet their high staffing scores indicate that back-ups are available to fill in among personnel assignments. One explanation for the relative influence of the staffing dimension in reflecting high overall effectiveness for cluster 5 is based on the predominance of long-linked units in this cluster. As mentioned earlier, the long-linked technology, with its lower skill requirements, requires fewer training and development activities but probably requires staff flexibility in job assignments.

The Origins of Effectiveness

It has been shown that both behavioral style factors as well as demographic characteristics can be related to differences in unit effectiveness.

That is, the cluster analysis revealed eight distinct patterns of unit behavior while the chi-square tests and ANOVAs demonstrated that the clusters varied on certain demographic dimensions. Finally, large between-cluster differences in overall effectiveness have been demonstrated. Further investigations will determine which of these factors determine unit effectiveness: the behavioral style, the demographic variables, or certain interactions among these sets of factors. Is it possible that two clusters having essentially the same function and technology, but differing in their style of operations, will be differentially effective in meeting their respective objectives? These questions have great implications for management theorists, as well as for students of organizational behavior.

References

Ball, G. H. Data analysis in the social sciences. In American Federation Information Processing Societies Conference Proceedings, 1965, 27, 533-559.

Bowers, D. G. & Seashore, S. E. Predicting organizational effectiveness with a four-factor theory of leadership. Administrative Science Quarterly, 1966, 11, 238-263.

Cyert, R. M. & March, J. G. A behavioral theory of organizational objectives. In M. Haire (Ed.), Modern Organization Theory. New York: Wiley, 1959.

Frost, P. J., Crandall, N. F., Mahoney, T. A., & Weitzel, W. Organization size as an influence on organization behavior. Paper presented at College of Organization, XVII International Meeting, The Institute of Management Sciences, March 1971.

Hulin, C. L. & Blood, M. Job enlargement, individual differences, and worker responses. Psychological Bulletin, 1969, 69, 41-55.

Jones, K. J. Problems of grouping individuals and the method of modality. Behavioral Science, 1968, 13, 496-511.

Likert, R. Measuring organizational performance. Harvard Business Review, 1958, 36, 41-50.

Mahoney, T. A. Managerial perceptions of organizational effectiveness. Management Science, 1967, 14, B76-B91.

Mahoney, T. A. & Weitzel, W. Managerial models of organizational effectiveness. Administrative Science Quarterly, 1969, 14, 357-365.

March, J. G. & Simon, H. A. Organizations. New York: Wiley, 1959.

Siegel, S. Nonparametric Statistics. New York: McGraw-Hill, 1956.

Tannenbaum, A. S. Control and effectiveness in a voluntary organization. American Journal of Sociology, 1961, 67, 33-46.

Thompson, J. D. Organizations in Action. New York: McGraw-Hill, 1967.

Ward, J. H. & Hook, M. E. Application of an hierarchical grouping procedure to a problem of grouping profiles. Educational and Psychological Measurement, 1963, 23, 69-82.

Weitzel, W., Mahoney, T. A., & Crandall, N. F. A supervisory view of unit effectiveness. California Management Review, in press.

Winer, B. J. Statistical Principles in Experimental Design. New York: McGraw-Hill, 1962.